## AMENDMENTS TO THE DRAWINGS

The attached sheets of drawings replace the original sheets including Figures 7 and 8.

## REMARKS

The independent claims are amended to include subject matter from respective dependent claims 21, 34, and 39 and language that finds support in but is not limited to the equation at the top of page 16. In addition, these claims are amended to recite in the claim body what was included in their respective preamble that the "optimal cost is independent of data packet forwarding in the multihop communications network." Entry, reconsideration, and allowance are respectfully requested.

Consideration and acknowledgment of the IDS submitted on June 11, 2009 are requested.

The drawing corrections required by the Examiner have been made in the attached replacement sheets.

Claims 32-39 stand rejected under 35 U.S.C. §101 as allegedly being non-statutory. This rejection is respectfully traversed.

Claim 32 now recites that a "computer-controlled node in the multi-hop communications network" performs the steps. Thus, claim 32 is tied to a particular machine. Claim 33 is a system claim so the Examiner's comments directed to method claims is not understood. However, as a precaution, claim 33 now recites that the multihop communications network includes a computer-controlled node (a machine) that includes the recited means elements. Accordingly, this rejection has been overcome and should be withdrawn.

Claims 20-24, 31-36, and 38-39 now stand rejected under 35 U.S.C. §102 as allegedly being anticipated by Biswas. This rejection is respectfully traversed.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros., Inc. v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). There must be no difference between the

claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. *Scripps Clinic & Research Found. v. Genentech Inc.*, 927 F.2d 1565, 1576 (Fed. Cir. 1991). Biswas does not satisfy this rigorous standard.

As explained in detail in the last office action, it is important to understand the differences between two routing functions—cost determination and forwarding. Cost determination refers to the process of determining a measure of how "close" a node is to some destination and is executed independently of traffic forwarding. An example of a cost determination scheme for routing is shortest path routing. In shortest path routing, the cost determination provides a single route between each source and destination so that a node having a packet to send knows to which next node to forward a data packet.

The second routing function is forwarding of data packets. In shortest path routing, forwarding only involves deciding which packet to send if multiple packets are available, and when to send a packet, since the path has already been determined by the shortest path determined in the cost determination process. Opportunistic forwarding refers to deciding a next hop node to send to, which packet to send if multiple packets are available, and when. The sending node bases the decision in part on the cost of the other nodes, (determined by the cost determination routing function described above), and preferably the momentary link cost to those nodes. A metric may be calculated indicating an effectiveness or desirability of each forwarding choice.

In Biswas's extremely opportunistic routing technique (ExOR), each packet is forwarded "through a sequence of nodes, deferring the choice of each node in the sequence until after the previous node has transmitted the packet on its radio. ExOR then determines which node, of all the nodes that successfully received that transmission, is the node closest to the destination. That

closest node transmits the packet. The result is that each hop moves the packet farther (on average) than the hops of the best possible predetermined route." See Abstract. But again, ExOR is a forwarding scheme—not a cost determination scheme.

The independent claims recite that "cost determination independent of data packet forwarding." The office action does not address this feature specifically or explain how it is disclosed in Biswas. In Biswas, cost determination is performed during packet forwarding/routing. In section 1, 3rd paragraph, Biswas states: "ExOR determines the path as the packet moves through the network." Section 3, 2nd paragraph states: "the first node in an ExOR forwarding sequence...." Section 3.4 states: "After the initial transmission, the nodes now transmit acknowledgements..." which makes clear that the cost determination in Biswas is not only done during forwarding, but is in fact also dependent on data packet forwarding. Biswas selects a candidate set of forwarding nodes in each step, and these nodes are ordered based on number of hops, i.e., the "closest" node is the first candidate. Section 3.4 decides which node from the candidate set actually forwards the packet. Specifically, each node in the set that hears the packet transmission from A sends an acknowledgement in priority order (i.e., based on its order in the candidate set), and these acknowledgements are used to determine which node will continue to forward the packet (node C in the example).

Thus, the forwarding of the data packets is an integral part of the Biswas technique because acknowledging receipt of each data packet is an essential step in determining the final transmission path. Furthermore, the "cost" of each neighbor node depends on the destination of the packet which is being forwarded (since cost is based on number of hops to the destination), again indicating that there can be no cost determination without packet forwarding in Biswas. Accordingly, Biswas does not describe and can not be used for cost determination independent

of packet forwarding. In other words, the claimed cost determination is done **before** the packet is forwarded/routed.

The independent claims further recite: "said simultaneously potential nodes jointly optimize a cost function based on a weighted combination of individual costs for each possible next hop node for said at least one of multiple nodes." Biswas also lacks this claim element. In Biswas, the candidate nodes (i.e., simultaneously potential nodes B, C, D in Fig. 1 and described in 3.1) are ordered and prioritized based on number of hops and delivery rates. The "closest" node in terms of number of hops (D in the example) is number one priority in the list. A tie is broken based on delivery rates, i.e., the tied node with the highest delivery rate is higher in the list. But this is not the claimed joint optimization of a cost function. Even if the ordering of nodes based on the number of hops and delivery rates can be construed as a type of cost function, the "joint optimization" as clarified in the claims is that the costs of all the candidate nodes are weighted and considered together. This is not done in Biswas – the candidate nodes are simply ranked in order of increasing "cost."

In opportunistic routing like ExOR, it is not known in advance which path a specific packet will take. Although the shortest path is in one sense the optimal path, the packet may in reality be sent along a different route, for instance, due to overloading of some of the links. Unlike Biswas, the claims take this into account by assigning a routing cost to a node, which is a weighted function of routing costs for a set of multiple possible neighboring nodes. Rather than just picking the "shortest" path like Biswas, the claimed technology considers or weighs the cost of several hops together.

Biswas also lacks the independent claim feature: "determining the optimal cost for said at least one of multiple nodes to be equal to the optimized value of the predetermined cost

function." The "at least one of multiple nodes" in Biswas corresponds to node A in section 3.1. Biswas does not assign a cost to node A, much less a cost that equals the optimized value of any cost function. Instead, in Biswas, node A determines a candidate set of next hop nodes, and this list of candidates is ranked in order of cost. Thus, Biswas determines a cost for each one of the simultaneously potential next hop nodes, i.e., nodes B, C, D, but not for itself—node A—which is the "at least one of multiple nodes."

In other words, while Biswas only selects the "closest node" in each step (albeit taking the delivery rate into account as well), the claimed technology assigns a cost to each node which depends jointly on the costs of a subset of its neighbors. It looks further ahead than just the next hop when assigning costs. Biswas can not do this because it determines cost during packet forwarding as explained above. Each node in Biswas only knows its neighbors in the immediate next hop, i.e., its candidate set of next hop nodes.

For the same reasons, the claim feature: "wherein said optimal cost is dependent of a respective cost for each of said plurality of simultaneously potential next hop nodes" is also missing from Biswas. There is no optimal cost being assigned to node A in Biswas (the "at least one of multiple nodes"), only an ordering of the potential candidates, based on the costs of each of them (taken separately). There is no point in assigning a cost to node A because node A has already received the packet. Assigning costs is only relevant to the potential next hop nodes B, C, and D, and Biswas does this based only on the distance and delivery rates for each of these nodes taken separately. As such, Biswas does not determine is no optimal cost for node A at all, let alone dependent of a respective cost for each of said plurality of simultaneously potential next hop nodes B, C, and D.

Because Biswas lacks multiple features in the independent claims, the anticipation based on Biswas should be withdrawn.

The application is in condition for allowance. An early notice to that effect is requested.

Respectfully submitted,

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